Appendix A Peer Review Group Members

The following individuals participated in the Peer Review Group:

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Christina Kuzmych Station Manager/Program Director WFIU(FM)	**Guy Bouchard** Senior Manager, Radio-Canada	**Paul Shullins** Chief Engineer WKLB-FM
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Ched Keiler Dir. of Engineering, Reach Communications	**Jobie Sprinkle** Director of Engineering/IT WFAE(FM)	**Ralph Hogan** Director of Engineering, KJZZ-FM
Chuck Leavens Dir.of Engineering & IT, WDUQ(FM)	**Joe Miller** Director Of Signal Development EMF Broadcasting	**Ronald Siqueira Barbosa** Technical Assessor, ABERT, Brazil
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Dick Cassidy Director of Content Operations, WAMU(FM)	**Lee Ferraro** General Manager, WYEP	**Tim Eby** Director and General Manager, St. Louis Public Radio
Don Danko Vice Pres. Engineering Cincinnati Public Radio	**Marco Tulio Nascimento** Technical Manager Sistema Globo de Rádio, Brazil	**Tom Godell** General Manager WUKY(FM)
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Appendix B Tests of First-Adjacent IBOC Interference to SCA

Introduction

The test bed is similar to the setup for SCA listener testing, described earlier herein. However, the impairments were determined objectively rather than by the listeners, as in the SCA compatibility tests. This allowed the evaluation of interference with a larger number of RF conditions and SCA receivers, without significantly expanding the scope of the tests.

The audio noise meter employed in this study complies with the ITU-R 468 standard, which combines a quasi-peak reading audio voltmeter with a frequency-weighting curve to objectively measure audio noise similar to the human ear. This instrument, called a "psophometer" is widely used when measuring noise in audio systems, especially in the UK and European countries. The psophometer was connected to the audio output of the SCA receiver. A 15 kHz audio low-pass filter was used if inaudible high-frequency noise might affect the readings of the psophometer. Reference level for psophometer calibration is a 1 kHz sinusoid at a peak deviation of 5 kHz (100% modulation). Noise level was measured with no modulation on the FM host main channel, other than a standard 19 kHz stereo pilot.

To represent typical reception conditions by an SCA user, the RF signal power were set for three input levels. One is equivalent to the received field strength at 20 km from a Class B (or Class C2) station, with adjustment for building losses and a -10 dBd antenna, representing a medium ("M") signal at 5 km from a Class B, representing a high ("H") signal, and at 40 km from a Class B, representing a low ("L") signal. Details and a link budget for these conditions are discussed below.

Notes on Test Procedures

The tests were prepared and conducted in accordance with the *20090723 Test Procedures v3.2.1* document, posted on Basecamp, with the following exceptions to the Test Bed Diagram in Figure 36:

- The Omnia 6EX-HD audio processor/stereo generator was placed on the Undesired Channel signal and the Audemat FMX-440 audio processor was placed on the Desired Channel signal.
  - It was felt that the Omni would be recognized as a more familiar audio processor for the important job of modulating the main channel of the first-adjacent interfering signal.
  - The Omnia processor used the "Adult Contemp" preset with a repeating clip of "High Density" music used in the over-the-air testing with WRNI and KBPN.
  - The Audemat processor does not have presets, but was set for the highest possible amount of compression and limiting.
  - The Desired Channel was modulated by a short repeating clip of audio from a very loud, dense passage of piano accompanied by a string quartet. This WAV clip was spooled from the lab PC through the Fireface 400, connected to the Audemat's audio input.
- The Desired Channel included an IBOC DAB signal from a Harris Dexstar, which was not shown on the Test Bed Diagram. A revised version of the Test Bed is included as Figure 36 - Test bed diagram for SCA Reception Testing with First-Adjacent IBOC Interference.

- It was felt this would better represent transmission conditions used by many public radio stations that operate radio reading services.
- The IBOC signal was operated in MP3 mode at -20 dBc.

- For program audio, the Desired Channel 67 kHz and 92 kHz SCA generators were fed with audio was spooled from the lab PC through the Fireface 400, rather than the Sony CDP-D500 CD deck. The PC also supplied a 1 kHz sinusoidal tone for lineup of the psophometer for objective testing.

The test followed the Test Plan section of the document, with the following exceptions:

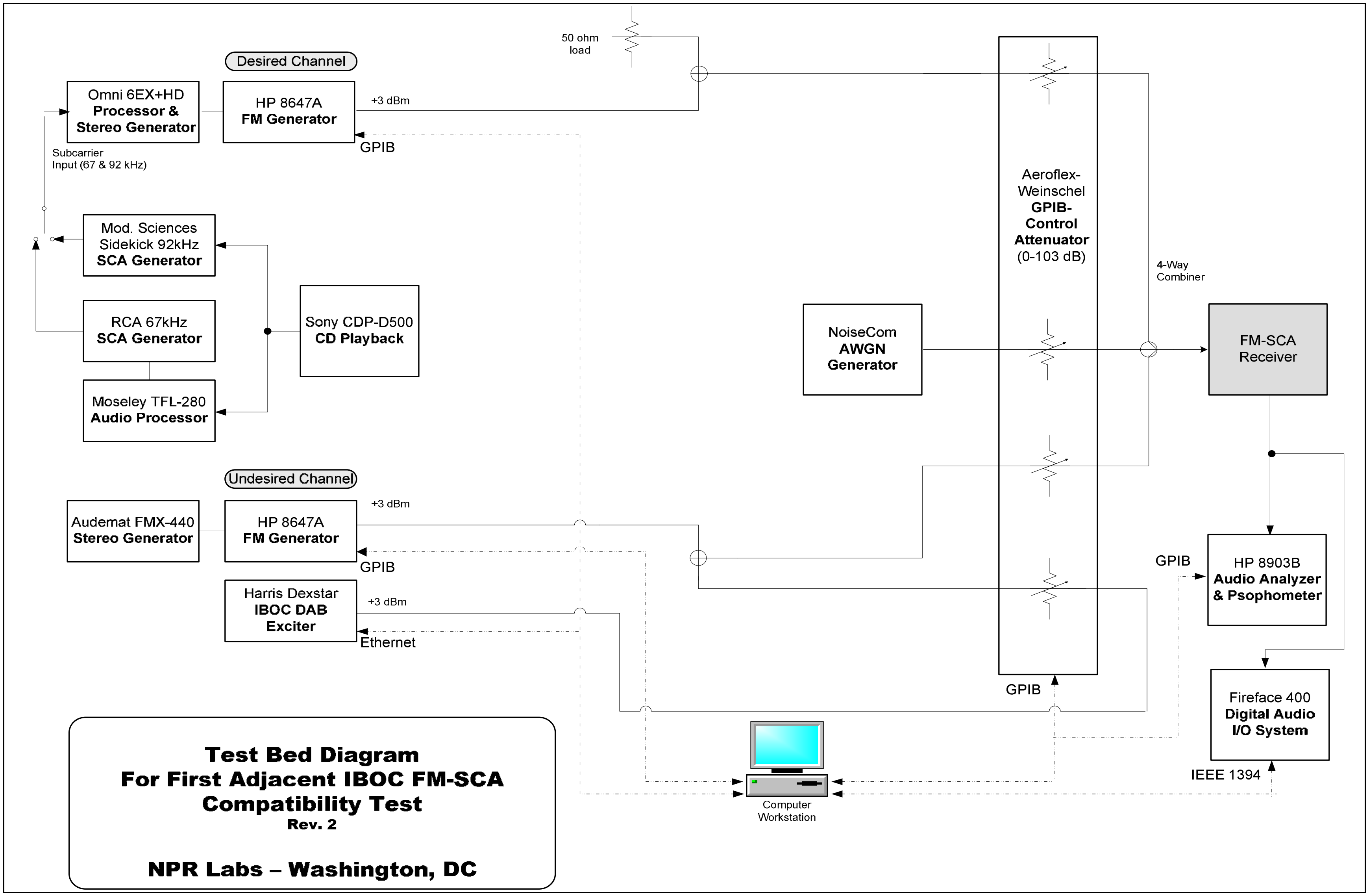
- Desired Channel RF levels for audio SNR were collected at eight points: -38, -48, -58, -68, -73, -78, -83 and -88 dBm. These covered reception conditions, as experienced from an indoor receiver with a whip antenna, from strong signal areas to well beyond the 60 dBμ contour.
- Separate tests were added to measure audio SNR with 30,000°K AWGN, with main channel crosstalk, with both AWGN and main channel crosstalk, in addition to unimpaired reception conditions.
- Based on limits of service with the four consumer SCA receivers tested, three required signal powers that were high enough to avoid receiving first-adjacent IBOC interference. This is discussed further, below. One receiver was capable of delivering adequate reception quality at a signal power equivalent to less than 60 dBμ. Interference testing was performed with that unit at a signal power equivalent to the 60 dBμ contour.

The receivers used for testing are listed in Table 7.

Table 7 - SCA Receivers tested

Make and Model	Subcarrier Frequency
McMartin TRE-5	67 kHz
Metrosonix MS-3390	67 kHz, 92 kHz
Norver NU-1C	67 kHz
Victory Electric VTT44A	92 kHz

Figure 36 - Test bed diagram for SCA Reception Testing with First-Adjacent IBOC Interference



Test Bed Measurement Results

It was anticipated that the performance of the receivers would vary widely, especially under the stress of high level modulation crosstalk from the main channel crosstalk. Each receiver was evaluated with crosstalk from fully-processed main channel audio and Additive White Gaussian Noise. The combination of both impairments was considered typical of reception conditions for consumer SCA receivers. However, only the McMartin TRE-5 receiver exhibited usable reception at FM RF levels that would approach the range at which reception may be affected by -10 dBc IBOC on a first-adjacent station. This was determined by ratio of field strengths from the desired and potentially-interfering stations, referenced to the signal-limited service radius of each receiver. This principle is illustrated below.

Figure 37 - McMartin TRE-5 Receiver Quieting vs. Received Signal Power

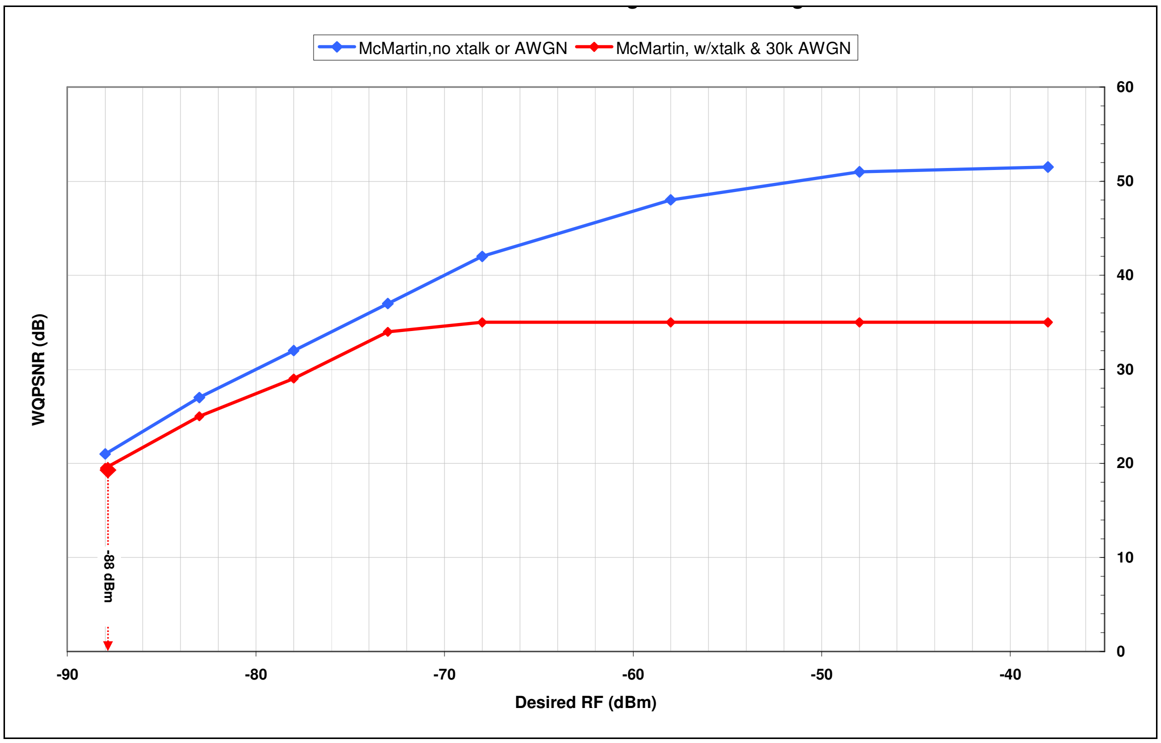


Figure 37 shows the weighted quasi-peak signal to noise ratio (WQPSNR) of the audio output jack of the McMartin TRE-5 receiver under two conditions: for ultimate quieting (no main channel modulation and added noise), and with both crosstalk and Additive White Gaussian Noise. It is apparent that crosstalk is a limiting factor in WQPSNR at higher RF levels, but internal noise eventually governs the receiver's noise level at weaker RF levels.

In consultation with several listeners, it was determined that in the absence of interference, adequate reception could be delivered at a signal power of -88 dBm, which is at the extreme left of the graph curve. This signal power was converted into an exterior field strength by the calculations in Table 8. Since most radio reading services operate on public radio stations operating in the Reserved FM Band, a frequency of 90 MHz was assumed. The Received Signal Level (RSL) of -88 dBm is converted to a power referenced to 50 ohms (all tests were performed with a 50-ohm source as 75-ohm sourcing did not materially affect the results with these receivers). The isotropic equivalent field, E_i was calculated from the power input, P_i with the formula shown in the column to the right. Dipole equivalent field strength was calculated by converting E_i from mV/m to dBμ and adding a 2.15 dB adjustment for the gain of a dipole relative to an isotropic antenna. The resulting field strength is 26.1dBμV/m. However, this is an interior field that requires conversions to use with the FCC's field strength curves.

Table 8 - Link budget for indoor SCA radio reception

f	Test Frequency	90	MHz	
λ	wavelength	3.33	m	300 / *f*
RSL	RSL	-88.0	dBm	
Pi	power	1.6E-12	W	10^ ((*RSL* - 30) / 10)
	voltage	9	uV	
Ei	Isotrope equiv. field	0.0026	mV/m	√(480* π^2 * (*Pi*) / λ^2) * 1000
Gi	Antenna gain rel. to Isotrope	2.15	dB	
	Dipole equiv. field	**26.1**	dBμV	60 + 20 * log (*Ei*) - *Gi*
	antenna loss relative to dipole	15	dB	NPR and BBC research
	building loss factor, 50th percentile	9	dB	Skomal & Smith, 90 MHz
	receive antenna height-gain adjustment below F(50,50)	9.6	dB	20*LOG(9.1/3)
	exterior field at rcv. height	**60**	dBμV	

The lower half of Table 8 considers the antenna loss relative to a dipole antenna. The length of the antennas used by the four SCA receivers was an average of approximately 400 mm. NPR's measurement of actual telescopic whip antennas in the DRCIA Project[10] indicated that this length produced an efficiency of approximately -15 dBd, which correlates well with research papers of BBC Engineering. A median building loss of 9 dB, as reported by Skomal and Smith for single-family residences at VHF frequencies, is listed. Last, a correction the receive height assumed the FCC F(50,50) and F(50,10) curves is made for the ground floor of a residence. These adjustments raise the equivalent field at the exterior of the home to 60 dBμV.

Table 9 - Calculations for Additive White Gaussian Noise

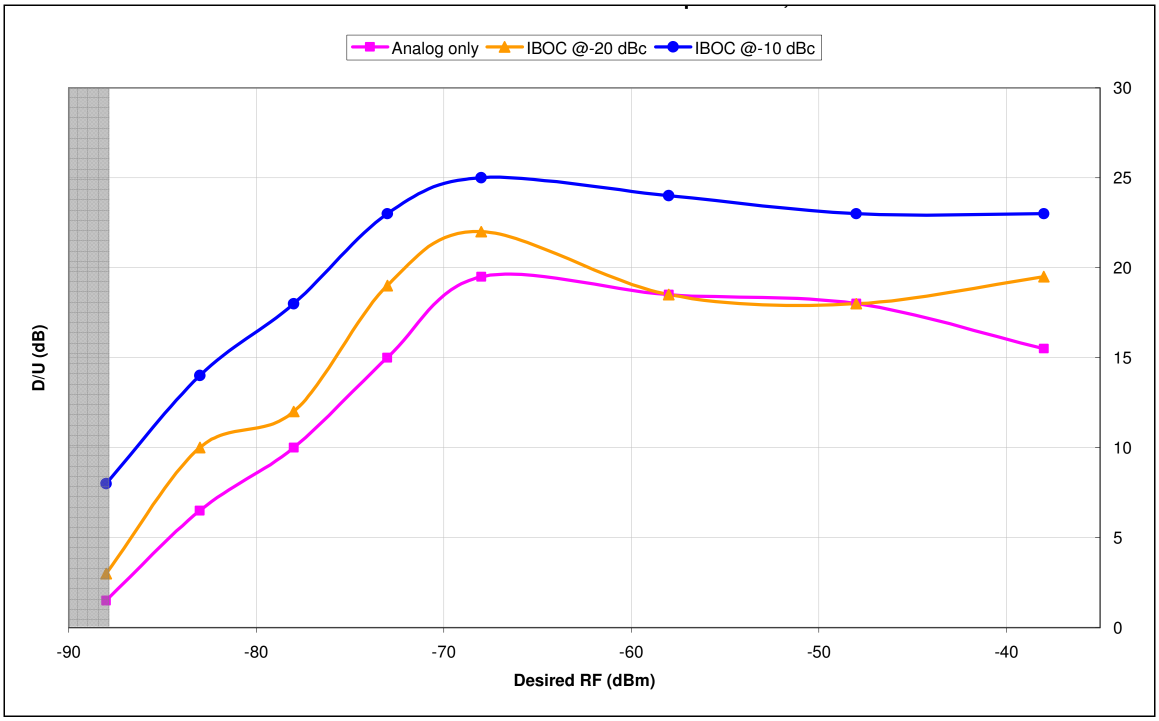
NoiseCom gen. out	-82.0	dBm/Hz	
Channel bandwidth, BW	200,000	Hz	
FM noise power	-29.0	dBm/channel bandwidth	10*log(BW*10^(-82/10))
NoiseCom attenuator	65.0	dB	
RF Attenuator setting	7.0	dB	
AWGN[dBm]	-101.0	dBm	
AWGN[mW]	8.0E-11	milliwatts	10*log(*AWGN*[dBm] /10)
AWGN[w]	8.0E-14	watts	
Noise Temp.	28,848	deg. K	*AWGN*[w] / (1.38e-25 * BW)
Equiv. Field	0.0059	mV/m	√(480* π^2 * *AWGN*[w] / λ^2) * 1000
Equiv. Field	15.3	dBμV	60 + 20 * log (*Equiv Field*)

[10] Digital Radio Coverage and Interference Assessment study, funded in 2007 and 2008 by the Corporation for Public Broadcasting.

As is apparent in the receiver test graph, the inclusion of Additive White Gaussian Noise had a significant effect on receiver performance. The correct level is determined with the above Table 9, in which the output of the NoiseCom generator in converted into a 200 kHz channel noise power of -29.0 dBm, using the formula shown in the right column. Taking into account RF test bed losses of 7 dB leading the receiver input, an RF attenuator setting of 65 dB produces an AWGN value of -101 dBm at the receiver. This AWGN power is converted into watts, and then into a noise temperature of 28,848 degrees Kelvin (approximately 30,000°K) using the Boltzman's Constant formula. The equivalent field strength in mV/m is determined from the AWGN power in watts and the wavelength at 90 MHz (3.33 m). Finally, the field is converted into dBµV.

It should be noted that the same losses for antenna efficiency, building penetration and height gain act upon the nominal value of 30,000°K.[11] In consideration of the 34 dB adjustment factor applied to the received signal, then, the corrected value of AWGN impressed on the receiver inputs was -135 dBm (-101 – 34 = 135). This level is less than internal receiver noise, however.

Figure 38 - First-adjacent D/U ratio required by McMartin receiver for 5 dB WQPSNR loss



The next step in receiver testing was to measure the audio WQPSNR under conditions of first-adjacent channel interference. Again, due to the wide variability in performance with different SCA receivers, it was not appropriate to use a single reference SNR value: for higher quality receivers, a drop of a few dB in SNR due to interference would be plainly audible, but may still be higher than the SNR available from a poorer receiver without interference. Thus, picking a delta, or drop, in SNR rather than 'lowest

[11] This is because nominal AWGN was determined for the FCC's standard reference height of 9.1 m (30 feet) above ground, for comparability to the FCC's curves. See The FM Broadcast Band: Service Area Noise Floors in the US, presented by iBiquity Digital Corp. to the Test Procedures Working Group on November 9, 2000.

common denominator' SNR would avoid unfairly degrading the potential quality of better-performing receivers. A delta of 5 dB was considered a significant change in the quality of reception, usually representing a Mean Opinion Score drop of at least a half a point on a 5-point scale.

The measurements Figure 38 show the D/U ratio producing a 5 dB reduction in WQPSNR relative to the reference audio SNR (the red curve in Figure 37). The entire range of Desired FM RF levels is shown, although only the ratios at -88 dBm are relevant to the McMartin SCA receiver under test. The shapes of the curves are determined by the audio SNR of reference curve, which rises with RF lever and levels off above -70 dBm. The span between analog-only and IBOC curves is reasonably constant, indicating that the interference phenomenon is linear, that is, determined by the interfering signal levels and not generated internally.

Conducting a test at an equivalent field strength of 60 dBµ provides a simple way to evaluate potential interference, compared to locations located within the service contour: *47CFR73.509(a)* of the FCC's rules related to prohibited contour overlap require a minimum D/U ratio of 6 dB, as well as sections of the rules pertaining to protection of Non-Reserved Band Stations. The results in Figure 38 show that the minimum D/U ratio required to prevent an audio SNR loss of more than 5 dB is approximately 8 dB. Since this exceeds the FCC's 6 dB ratio, the audio SNR degradation would exceed the standard assumed for this study.

Appendix C WRNI Test Routes

Figure 39 - WRNI(FM), Narragansett, Rhode Island, contour and preliminary route evaluation

Detailed View of Audio Test Routes

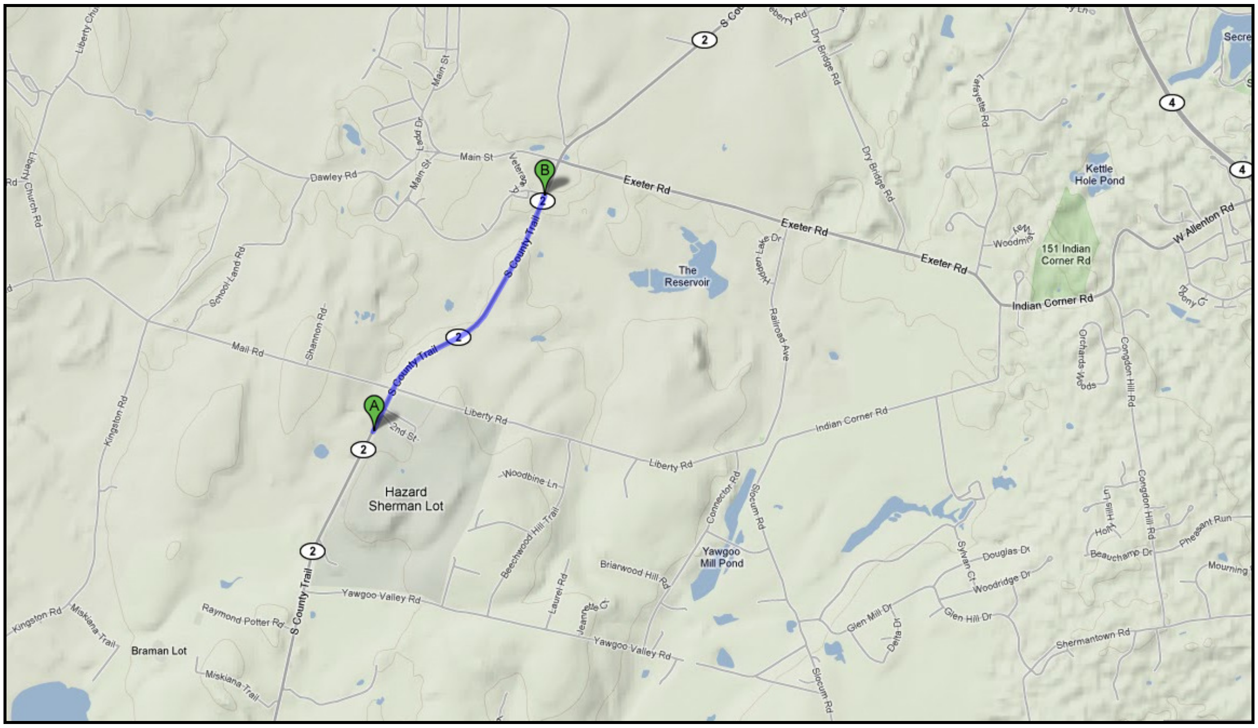


Figure 40 - WRNI Route 1

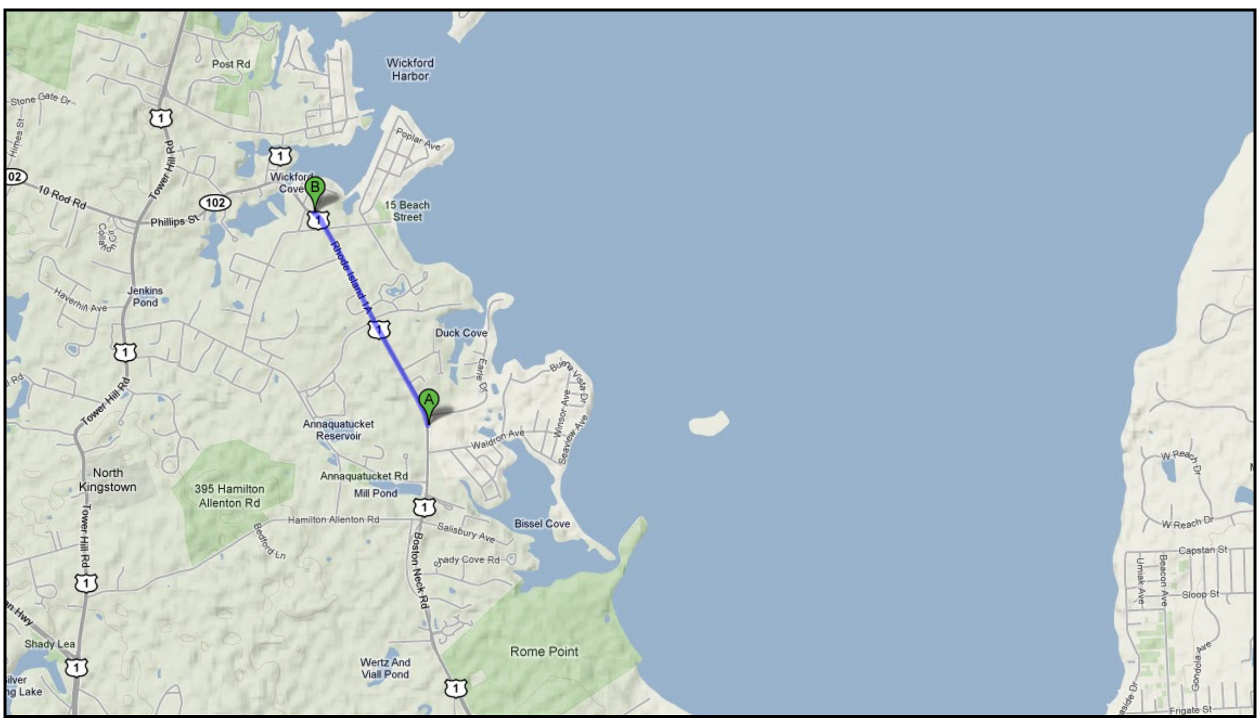


Figure 41 - WRNI Route 2

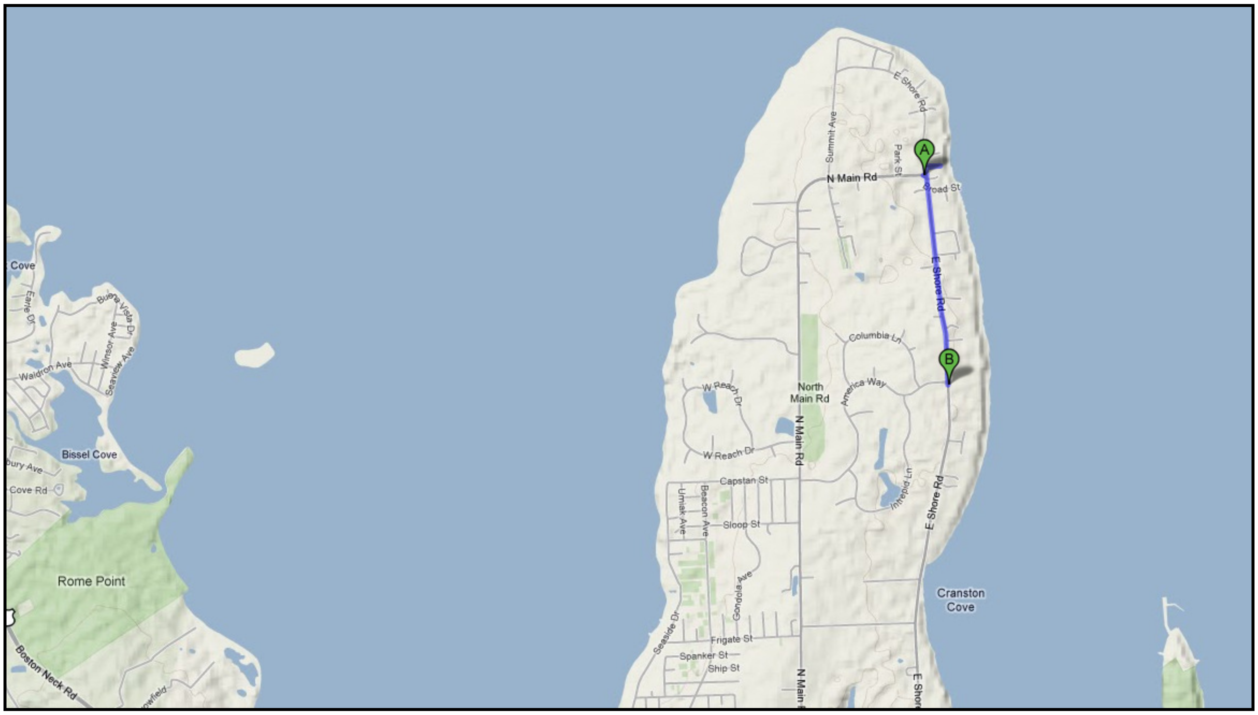


Figure 42 - WRNI Route 3

Appendix D KBPN Test Routes

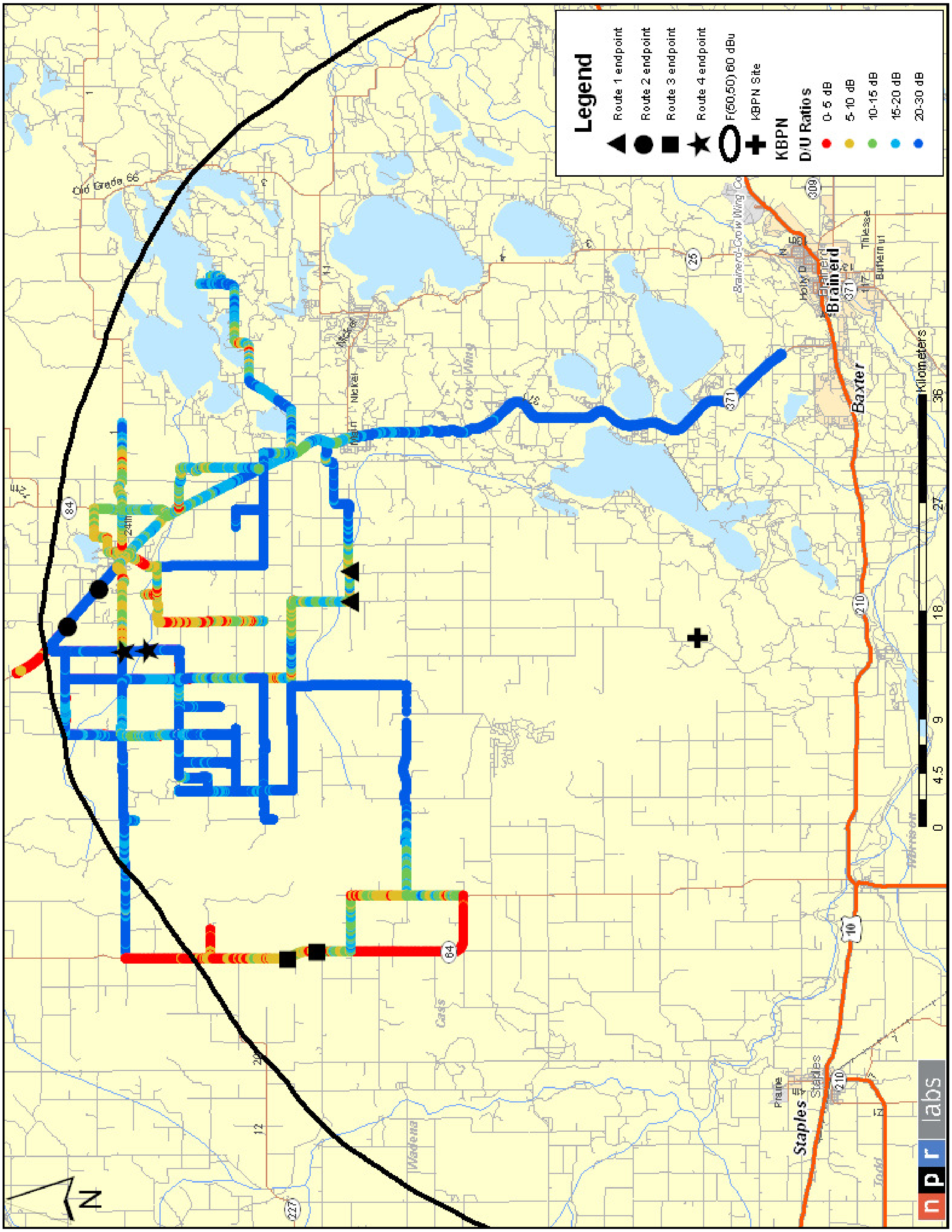


Figure 43 - KBPN, Brainerd, Minnesota, contour and preliminary route evaluation

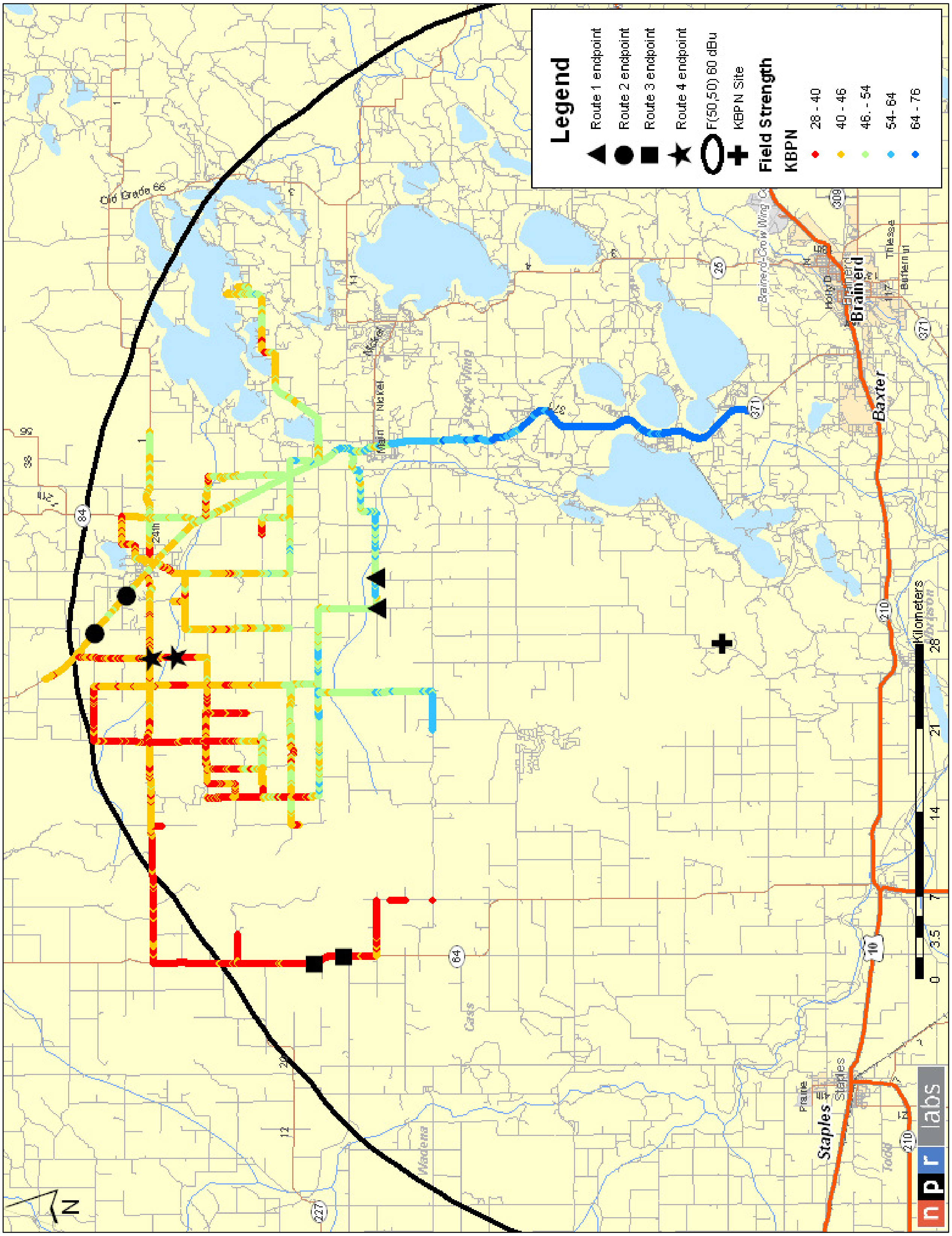


Figure 44 - Field strengths of KBPN on preliminary route evaluation

Detailed View of Audio Test Routes

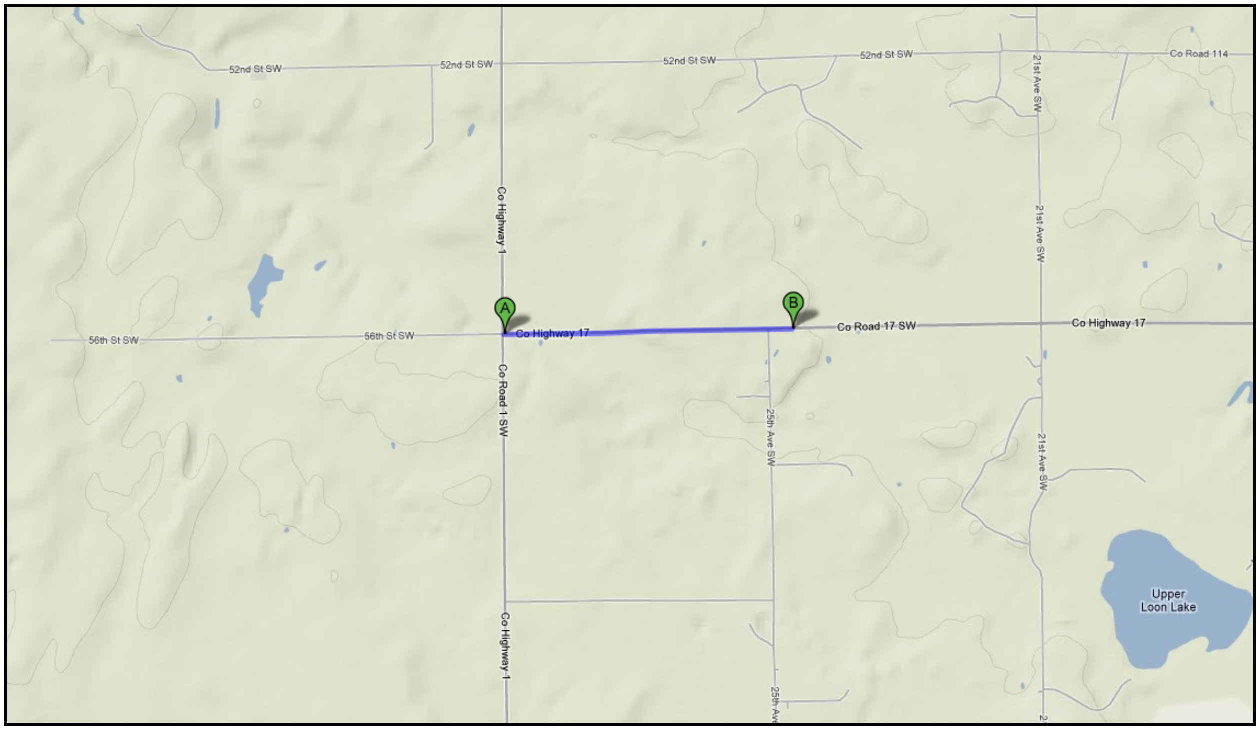


Figure 45 - KBPN Route 1

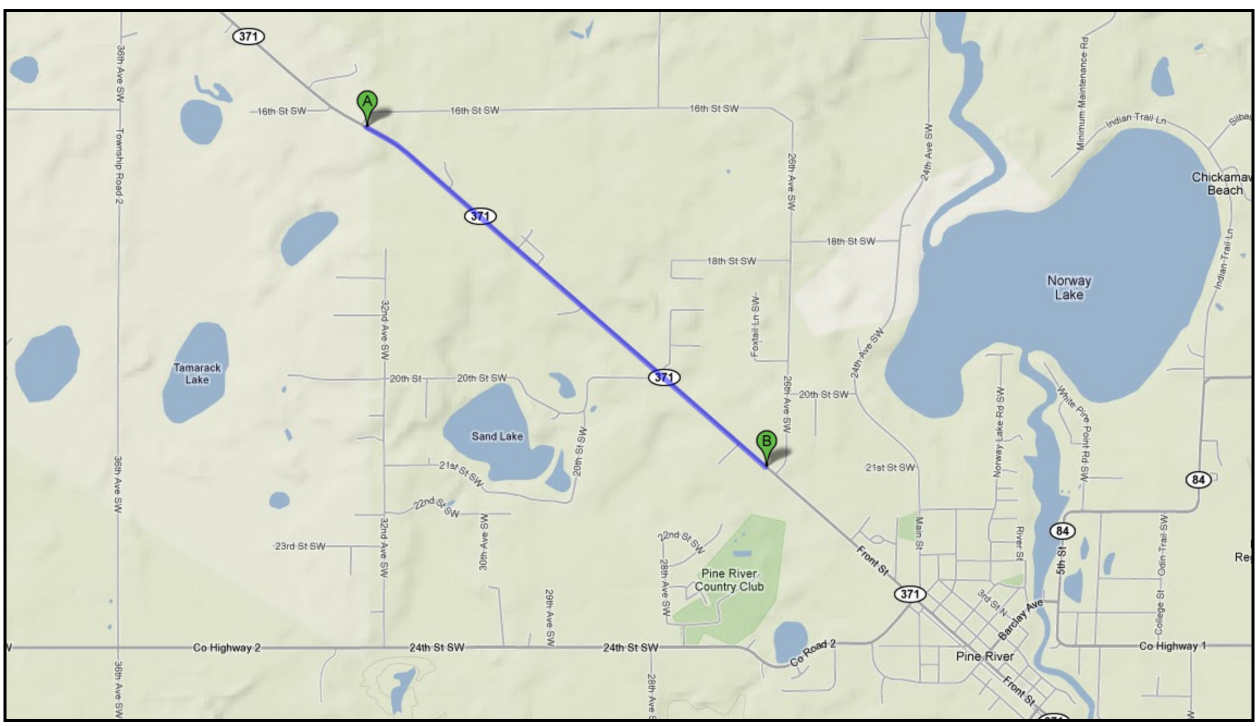


Figure 46 - KBPN Route 2

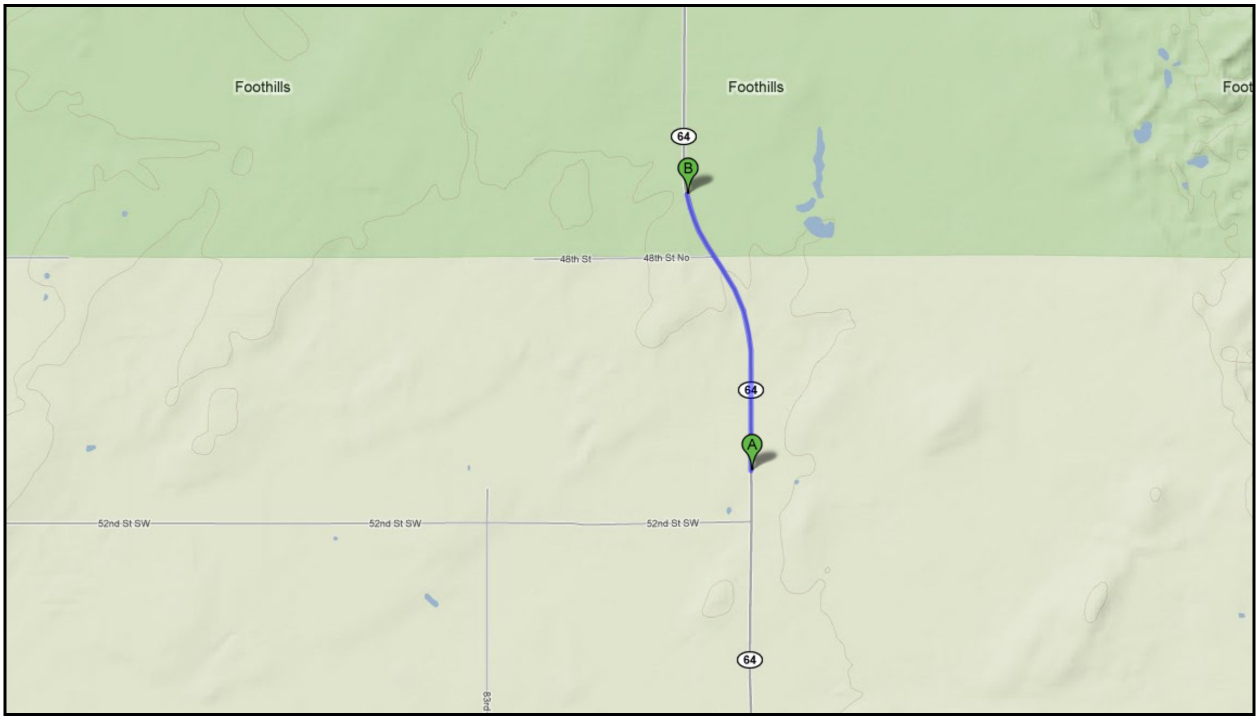


Figure 47 - KBPN Route 3

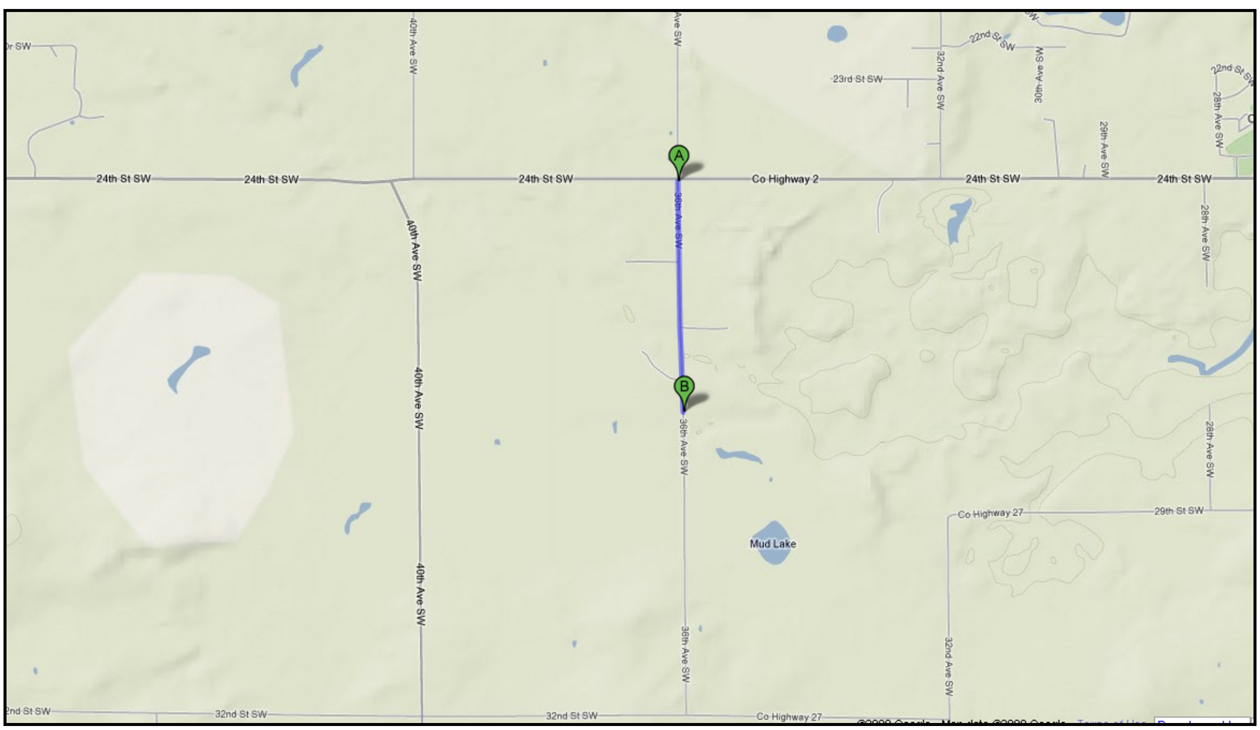


Figure 48 - KBPN Route 4

Appendix E KLDN Test Routes

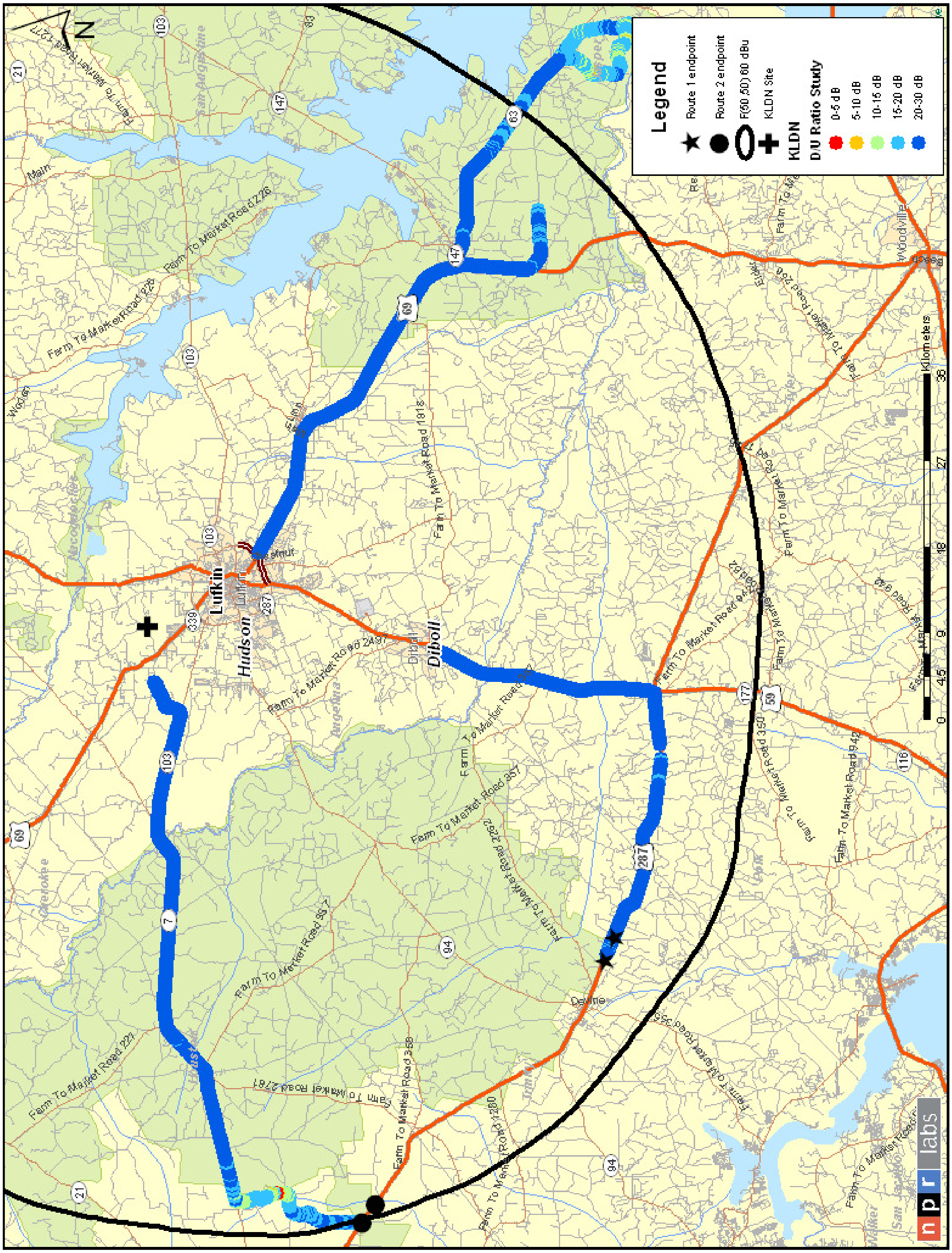


Figure 49 - KLDN, Lufkin, Texas, contour and preliminary route evaluation

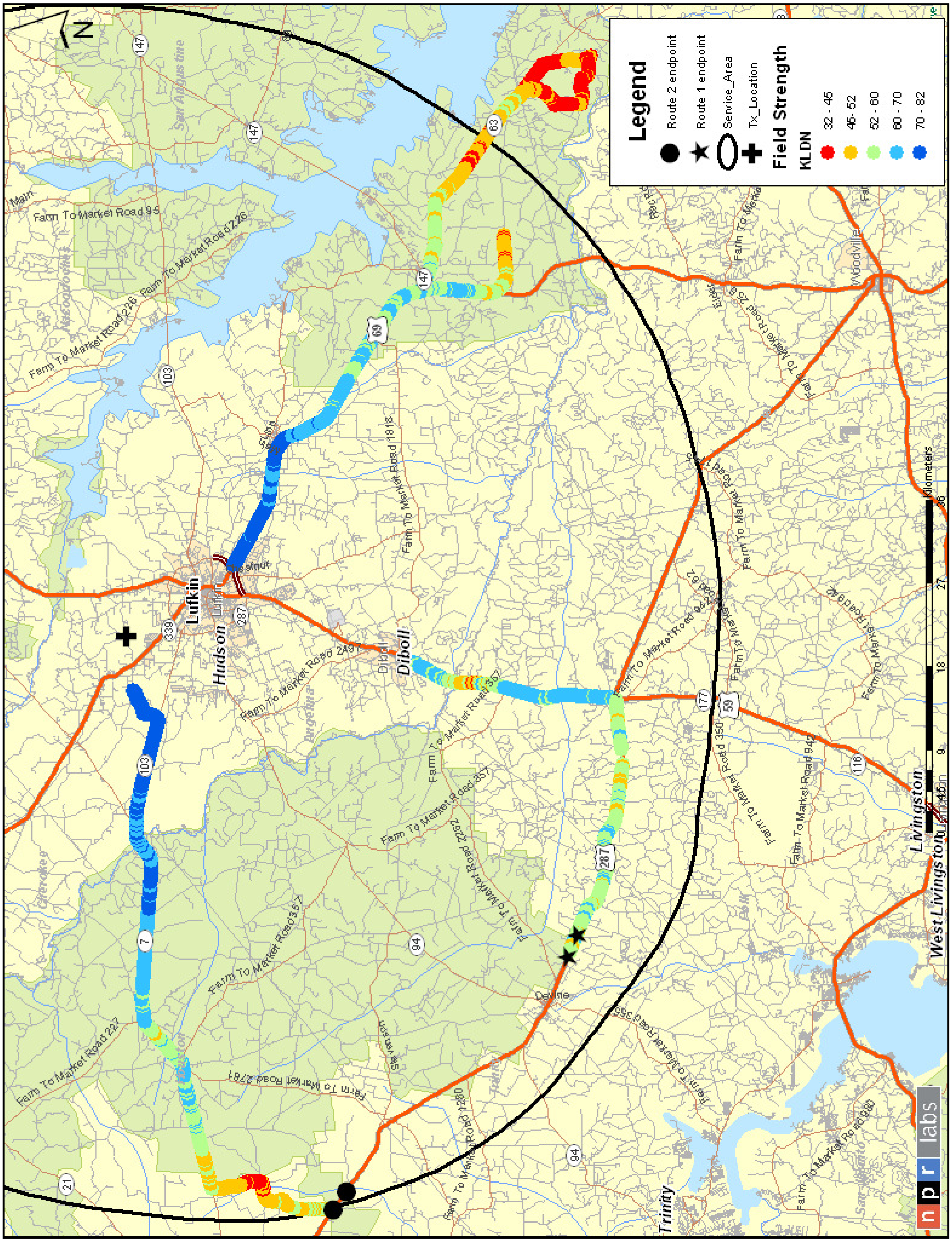


Figure 50 - Field strengths of KLDN on preliminary route evaluation

Detailed View of Audio Test Routes

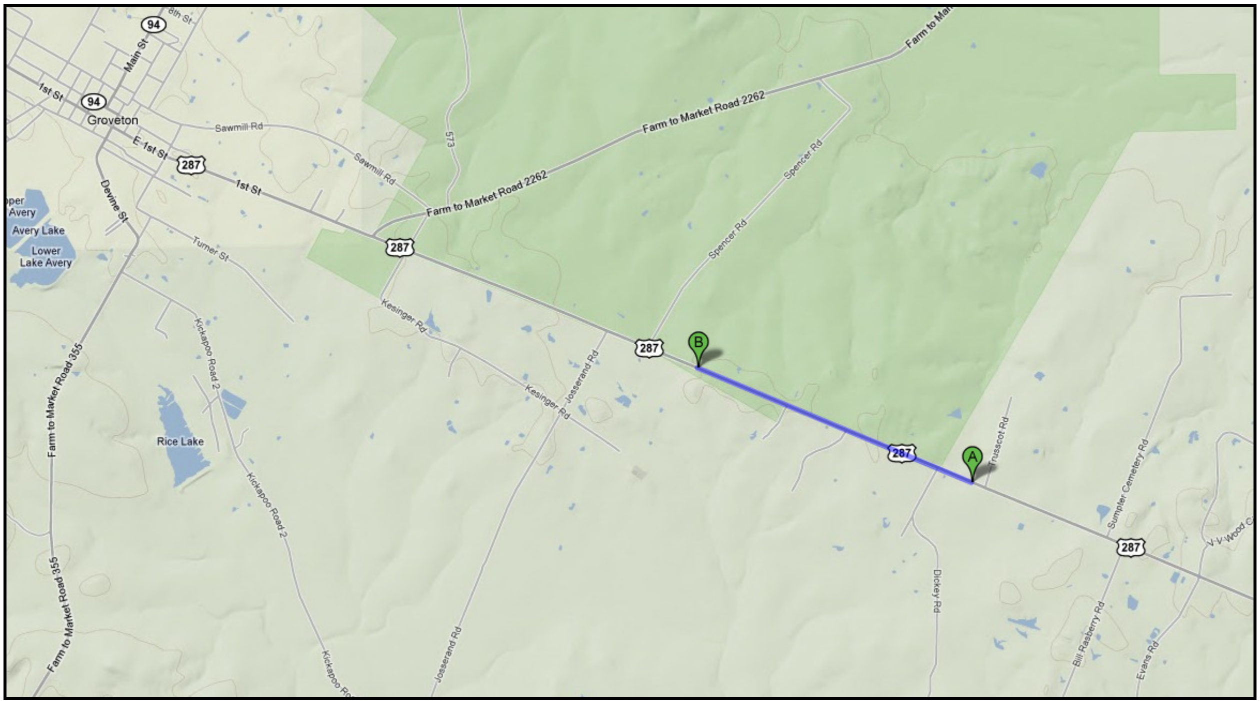


Figure 51 - KLDN Route 1

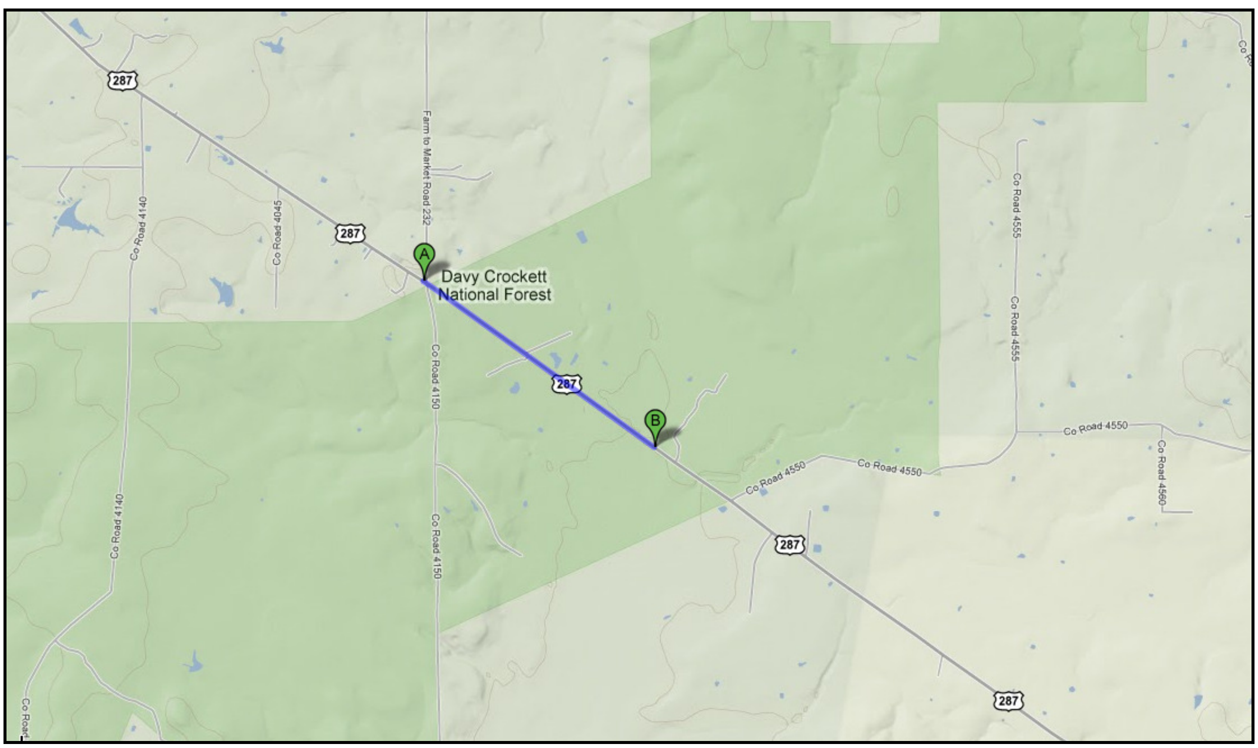


Figure 52 - KLDN Route 2

Appendix F KBWA Test Routes

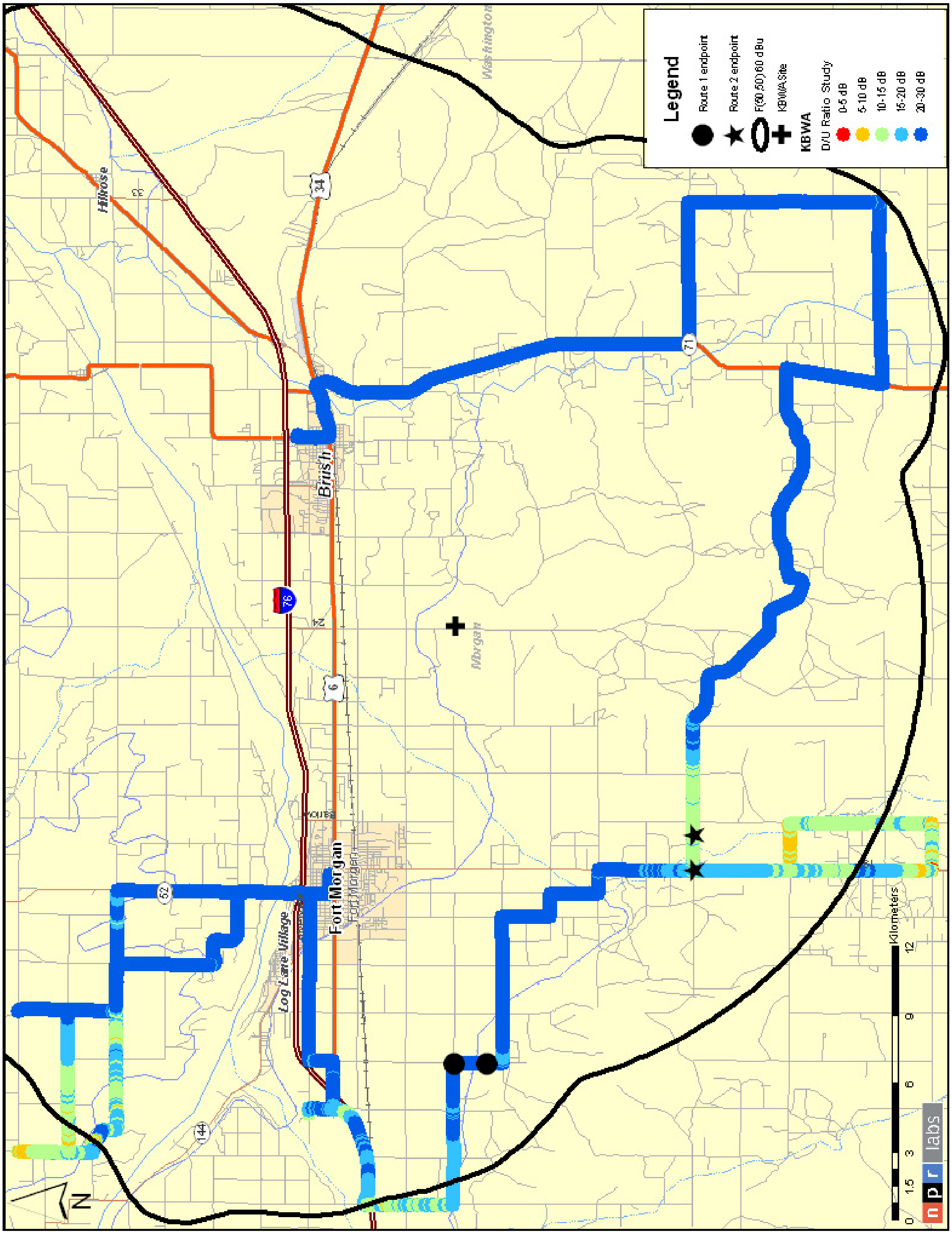


Figure 53 - KBWA, Brush. Colorado, contour and preliminary route evaluation

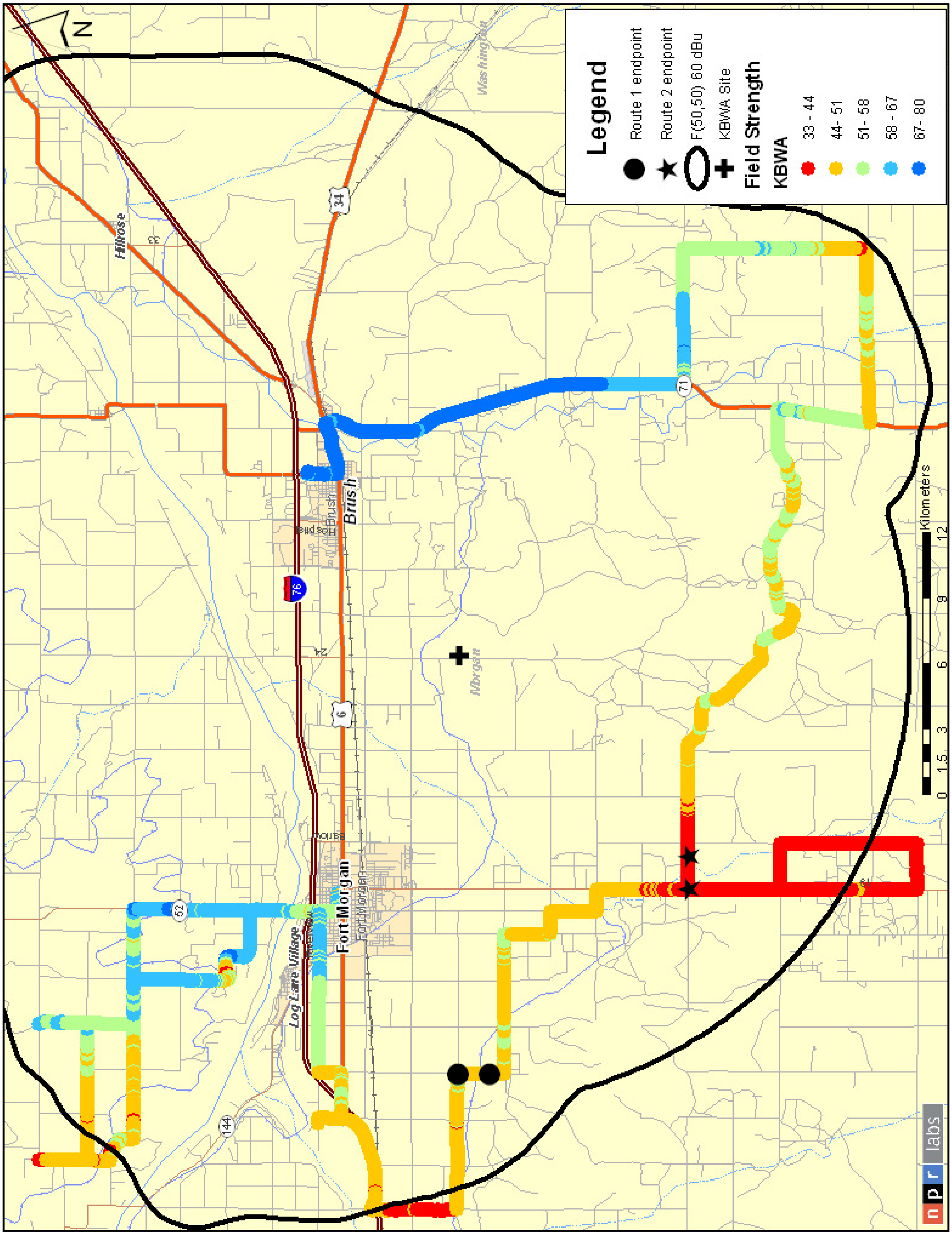


Figure 54 - Field strengths of KBWA on preliminary route evaluation

Detailed View of Audio Test Routes

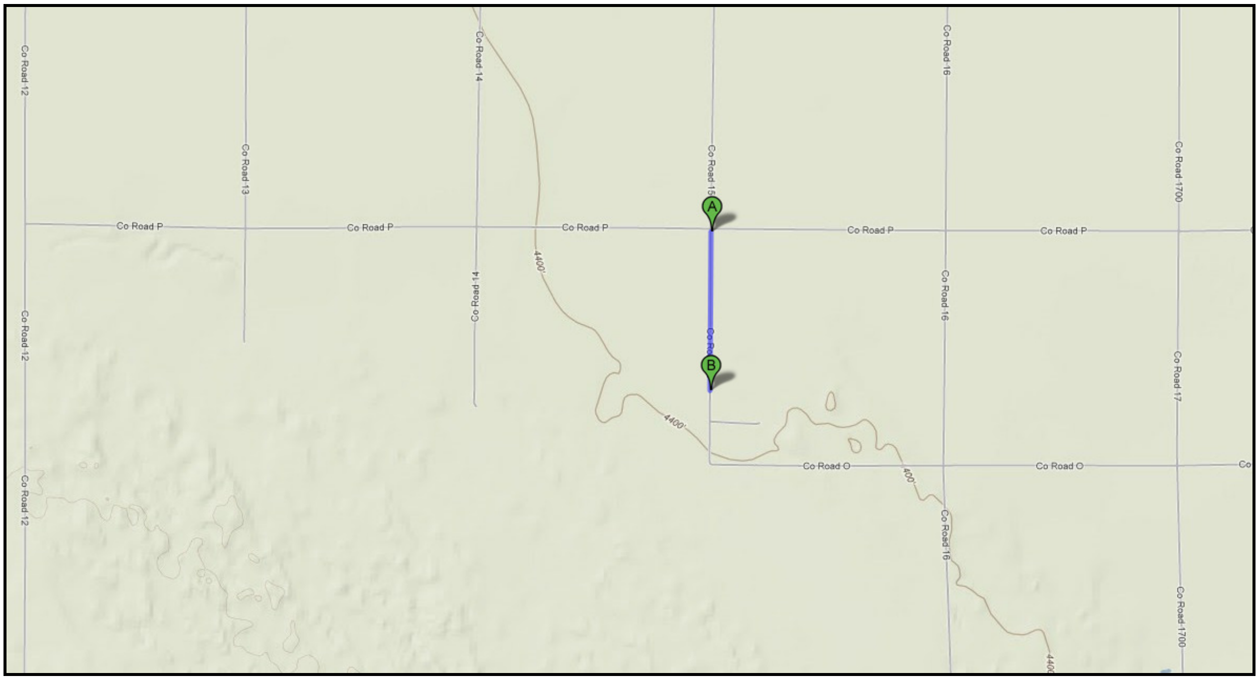


Figure 55 - KBWA Route 1

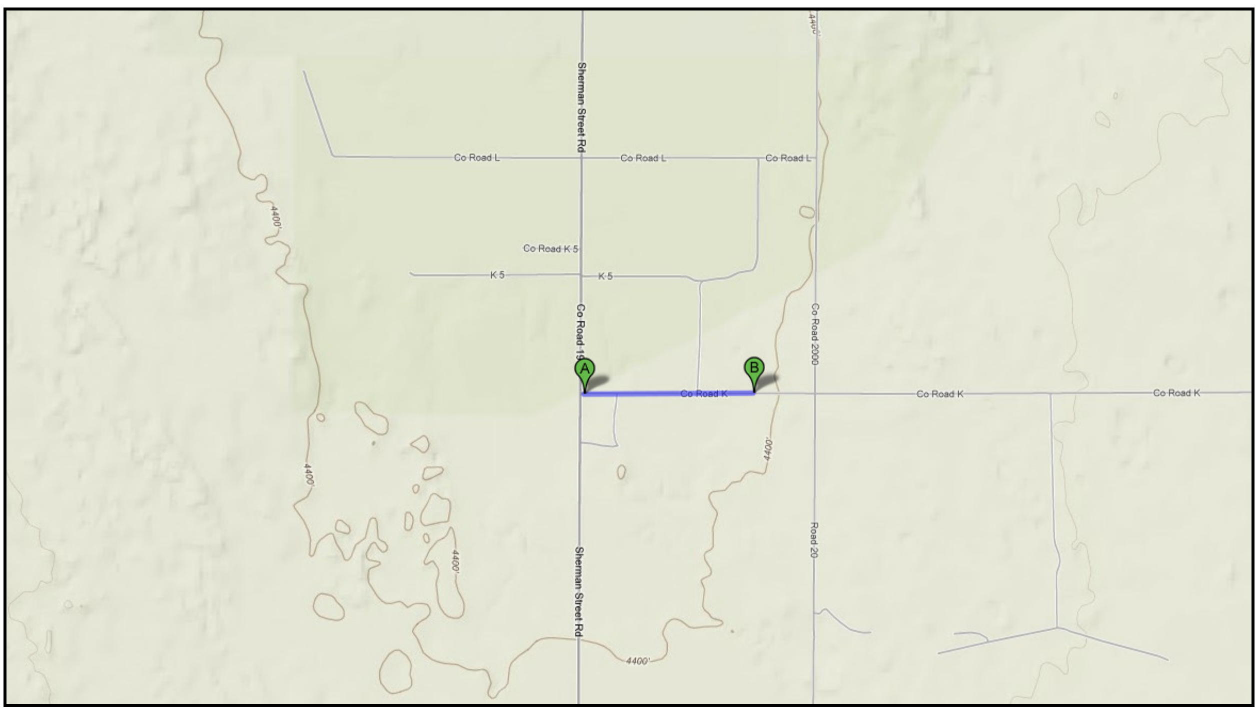


Figure 56 - KBWA Route 2

Appendix G Mobile Audio Test Procedures

The following step-by-step procedures were employed with each of the four station pairs. IBOC injection levels (analog only, -20 dBc, -14 dBc, -10 dBc) of the undesired 1st adjacent interferer station, at each test location. Therefore, this set of procedures was run completely 4 times through at each test site, for a total of 16 passes on each test route.

Step #	Activity
1	Call **IBOC test station** to set IBOC injection
2	Call **Interference Test Station** to prepare to roll **Female Speech** track
3	Begin field strength recording
4	Begin audio recording
5	Cue desired to roll **Female Speech** track
6	Momentary interrupt in antenna input for synch of recordings
7	Drive route - approx. 80 seconds elapsed time
8	Return to starting point
9	Repeat steps 2 through 5 with same audio track
10	Call desired station to prepare to roll **Male Speech** track
11	Begin field strength recording
12	Begin audio recording
13	Cue desired station to roll Male Speech track
14	Drive route - approx. 80 seconds elapsed time
15	Return to starting point
16	Repeat steps 8 through 11 with same audio track
17	Call desired station to prepare to roll **Low Density** Music track
18	Begin field strength recording
19	Begin audio recording
20	Cue desired station to roll **Low Density Music** track
21	Drive route - approx. 80 seconds elapsed time
22	Return to starting point
23	Repeat steps 14 through 17 with same audio track
24	Call desired station to prepare to roll **High Density** Music track
25	Begin field strength recording
26	Begin audio recording
27	Cue desired station to roll **High Density Music** track
28	Drive route - approx. 80 seconds elapsed time
29	Return to starting point
30	Repeat steps 20 through 24 with same audio track

Appendix H Vehicle Acoustic Measurements

Neil Shade – Acoustical Design Collaborative, Ltd. – Ruxton, Maryland

Acoustical measurements were performed on 17 automobiles to determine the noise levels from driving and the in-dash audio system performance. These acoustic data were used as part of the evaluation process to select three automobiles to be used for the subjective driver assessments of simulated digital radio broadcasts.

A Norsonic NOR-140 sound analyzer with a Norsonic Type 1209 preamplifier and Type 1233 diffuse field microphone were used to collect the acoustical measurement data. The sound analyzer and microphone were calibrated with a Norsonic Type 1251 acoustical calibrator prior to and after performing the acoustical measurements for each automobile.

Each automobile was measured over a 15 minute time period while driving at 35 and 60 mph vehicle speeds. The sound analyzer microphone was mounted on a small flexible tripod that positioned the microphone capsule at the equivalent position of the front passenger's left ear. A two meter cable connected the microphone to the acoustic analyzer which was controlled from the rear passenger seat. The driving routes for the two vehicle speeds are described below.

- 35 mph – Airport Loop Road between Dorsey Road and Maryland Route 195
- 60 mph – Maryland Route 295 between Maryland Route 100 and Maryland Route 32

Both driving routes were over smooth asphalt pavement in good condition having a minimum of surface irregularities.

During vehicle driving sessions, the sound analyzer was paused when needed to exclude extraneous noises, such as other vehicle pass-bys, road expansion joints, pavement irregularities, and other sources not representative of the automobile's noise signature. The acoustic analyzer 'back-erase' function deletes the previous 5 seconds of measurement data after the analyzer is paused. Thus, the measured noise levels are representative of the automobile only.

The vehicle noise levels were measured in terms of 1/1 octave bands from 32 to 16,000 Hz, in addition to A-weighted and C-weighted levels. The noise levels are in terms of an equivalent level (Leq) which can be considered an 'average' over the measurement duration. The 1/1 octave band levels were used to compute the automobile loudness in sones.

The automobile radio frequency response was measured by playing a compact disc (CD) with pre-recorded pink noise. Before performing the measurements, the audio system tone and balance controls were set to the center detent positions, effectively bypassing the controls. The acoustic analyzer measurement microphone was kept in the same position as used for the automobile noise levels. Measurements were performed in 1/3 octaves between 63 and 8000 Hz for different volume control settings. The volume control was set between subjectively 'moderate' to 'loud' sound levels. Typically, sound level increments of 2 volume control steps for each in-dash audio system were used for each vehicle's volume level settings. Measurements over a 15 second time period were performed for the different sound levels. All measurements were performed when the automobile was stationary.

<u>Measurement data provided by Mr. Shade.</u>

Table 10and Table 11 summarize the acoustic noise measurements for Family Sedan vehicles, one of five vehicle categories measured. Figure 57 illustrates the results of audio frequency response measurements on the sound systems of all 17 vehicles, as standard deviations of 1/3-octave measurements of each vehicle.

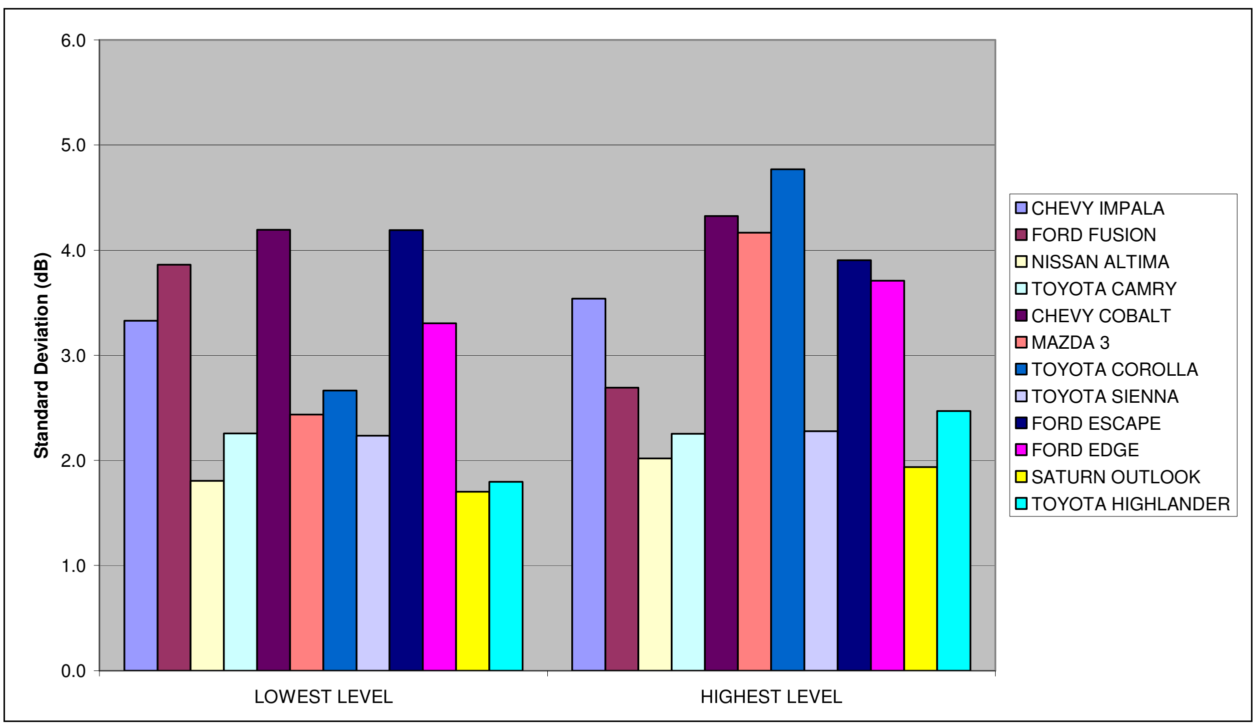
Table 10 – Family Sedan Acoustic Noise Measurements at 60 MPH

ACOUSTIC METRIC	Chevy	Ford Fusion	Honda Accord	Nissan Altima	Toyota Camry
A-WTD	64	64	67	64	64
C-WTD	84	86	86	86	84
SONE	12	13	14	13	12
L90	63	62	66	61	56
L50	64	64	67	64	57

Table 11 – Family Sedan Acoustic Noise Measurements at 35 MPH

ACOUSTIC METRIC	Chevy	Ford Fusion	Honda Accord	Nissan Altima	Toyota Camry
A-WTD	57	58	60	59	58
C-WTD	79	86	86	84	83
SONE	10	10	10	10	9
L90	55	57	58	58	56
L50	57	58	59	59	57

Figure 57 - Standard Deviations of Audio System Response from 630 Hz To 8 kHz at Low and High Playback Levels



Appendix I Joint Probability of Service and Interference

Besides operation at lower average signal strengths than indoor reception, mobile reception has other differences from indoor listening. For one, received signals experience large fluctuations in magnitude as the location changes, referred to a Raleigh fading (in cases where the propagation by line of sight is not dominant). This fluctuation occurs to both a desired and any interfering signals, and is usually uncorrelated due to the independent paths to the receiver. For a given percentage of time and other considerations, the probability of interference to reception can be determined as follows:[12]

Let

F_d = field strength of the desired signal, expressed in dB

F_u = field strength of the undesired signal, expressed in dB

F_s' = minimum value of the desired field strength level for acceptable service in the absence of interference for a given percentage of time

R = desired to undesired field strength ratio ($F_d - F_u$), in dB, at which threshold interference occurs.

Assuming that F_d and F_u are independent, normally distributed variables with medians and standard deviations of (F_{dm}, σ_L) and $(F_{um}.\sigma_L)$ respectively, the joint probability density function is[13]

$$f(F_d, F_u) = \frac{1}{2\pi\sigma^2} = \exp\left\{\frac{-1}{2}\left[\left(\frac{F_d - F_{dm}}{\sigma_L}\right)^2 + \left(\frac{F_u - F_{um}}{\sigma_L}\right)^2\right]\right\}$$

In the presence of an undesired signal, it can be shown that for an assumed standard deviation of 6 dB and a 10% probability of interference the signal strength ratio of F_d and F_u is

$$R = 0.1 \cdot \sqrt{2} \cdot 2 = 0.28 = 11dB$$

The ratio *R*, is the effective de*crease* in protection relative to the median ratio for threshold interference.[14] Thus, the interference under mobile fading can be substantially worse in the short term than the median conditions.

On the other hand, cabin noise in a moving vehicle is higher than most indoor environments, and may be expected to mask the audibility of interference from IBOC to mobile FM reception. As discussed further in Subjective Test, below, it is believed that the best approach to measurement includes both mobile fading effects and cabin noise.

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[12] A Computer Program for Calculating Effective Interference to TV Service, by Harry K. Wong, FCC OET Technical Memorandum 82-2, July 1982.

[13] Distributions in Statistics: Continuous Multivariate Distributions, by Norman L. Johnson and Samuel Kotz; A Wiley Publication in Applied Statistics; John Wiley & Sons, Inc., 1972.

[14] In its maps of IBOC interference, NPR Labs used RF interference ratios with an audio impairment criteria of 40 dB weighted quasi-peak SNR. With median time and location predictions, however, it is probable that mobile fading degrades the audio SNR by up to 11 dB (a net of 29 dB) by the example of *R,* above.

Appendix J Allowable IBOC Transmission Power Calculator

As a simple and effective procedure for determining the allowable IBOC power in excess of the proposed blanket increase to -14 dBc, NPR Labs has developed a procedure for Reserved Band and Non-Reserved Band stations, based on the FCC's standard allocation techniques. The allowable power can be calculated with this method by any engineer using tools available on the FCC's web site for calculating distances, bearing, and field strength. NPR has prepared calculations for all FM stations to illustrate the procedure, which is described below.

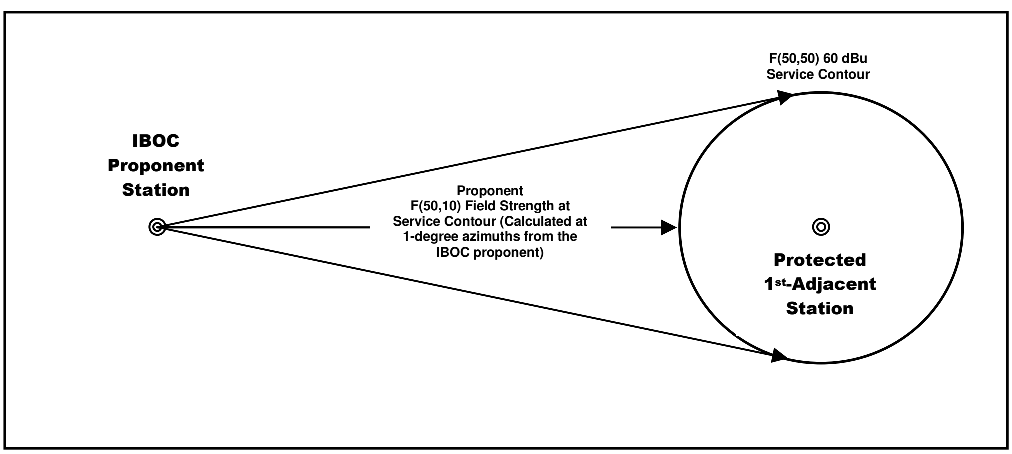
Procedures for All Stations

NPR's approach allows any FM station to operate with IBOC power in excess of the -14 dBc blanket increase, subject to minimum protection requirements as determined from NPR Labs' tests with actual over-the-interference audio.[15] The allowable power is determined as follows:

1. For the IBOC proponent station, identify all licensed and authorized (construction permit) stations on upper and lower first-adjacent channels with F(50,50) 60 dBμ service contours that are proximate to the proponent's F(50,10) 48 dBμ contour.
2. Calculate the F(50,50) 60 dBμ service contour of each protected 1st-adjacent station identified above, taking into account the HAAT and antenna radiation pattern on radials each 1 degree of azimuth.
3. Determine the F(50,10) field strengths for the IBOC proponent station at 1 degree azimuths along the protected service contour of each 1st-adjacent station, taking into account the antenna radiation pattern and HAAT on these bearings.[16]
4. Between the maximum IBOC power of -10 dBc and a blanket minimum power of -14 dBc, the allowable digital power for the IBOC proponent, toward any point on the service contour of the protected 1st-adjacent station, is:

Allowable IBOC power = [2.27 * (60 - (IBOC station F(50,10) dBμ)) – 33.6]

A simple diagram showing the key parameters in the allowable IBOC power determination is included below.



[15] Testing completed for Advanced IBOC Coverage & Compatibility Study, funded by the Corporation for Public Broadcasting.

[16] This assumes that the IBOC proponent station utilizes the same transmitting antenna for digital emissions as the analog host FM. Differences such as the height of the radiation centers or different directional radiation patterns must be considered separately from the above method.

Appendix K   Grandfathered Super-power Class B Stations

Call Sign	City	State	Channel	Class	ERP	HAAT
KPFA	BERKELEY	CA	231	B	59.0	405
KSKS	FRESNO	CA	229	B	68.0	580
KSCA	GLENDALE	CA	270	B	5.0	863
KHHT	LOS ANGELES	CA	222	B	42.0	887
KCBS-F	LOS ANGELES	CA	226	B	29.0	1,056
KTWV	LOS ANGELES	CA	234	B	52.0	863
KLOS	LOS ANGELES	CA	238	B	61.0	954
KYSR	LOS ANGELES	CA	254	B	75.0	360
KKBT	LOS ANGELES	CA	262	B	5.0	916
KRTH-F	LOS ANGELES	CA	266	B	51.0	955
KIIS-F	LOS ANGELES	CA	274	B	8.0	902
KOST	LOS ANGELES	CA	278	B	13.0	949
KBIG-F	LOS ANGELES	CA	282	B	84.0	882
KMZT-F	LOS ANGELES	CA	286	B	18.0	880
KLVE	LOS ANGELES	CA	298	B	30.0	914
KWAV	MONTEREY	CA	245	B	18.0	747
KHYZ	MOUNTAIN PASS	CA	259	B	8.0	551
KDON-F	SALINAS	CA	273	B	19.0	692
KOLA	SAN BERNARDINO	CA	260	B	30.0	507
KMYI	SAN DIEGO	CA	231	B	100.0	188
KYLD	SAN FRANCISCO	CA	235	B	30.0	369
KOIT-F	SAN FRANCISCO	CA	243	B	24.0	480
KLLC	SAN FRANCISCO	CA	247	B	82.0	309
KISQ	SAN FRANCISCO	CA	251	B	75.0	310
KFRC-F	SAN FRANCISCO	CA	259	B	40.0	396
KIOI	SAN FRANCISCO	CA	267	B	125.0	354
KDFC-F	SAN FRANCISCO	CA	271	B	33.0	319
KITS	SAN FRANCISCO	CA	287	B	15.0	366
KMEL	SAN FRANCISCO	CA	291	B	69.0	393
KEAR	SAN FRANCISCO	CA	295	B	80.0	305
KBRG	SAN JOSE	CA	262	B	15.0	786
KZOZ	SAN LUIS OBISPO	CA	227	B	23.0	472
KMGQ	SANTA BARBARA	CA	248	B	16.0	890
KTYD	SANTA BARBARA	CA	260	B	34.0	390
KRUZ	SANTA BARBARA	CA	277	B	105.0	905
KSTN-F	STOCKTON	CA	297	B	8.0	491
KHAY	VENTURA	CA	264	B	39.0	369
WHTS	ROCK ISLAND	IL	255	B	39.0	274
WTTS	BLOOMINGTON	IN	222	B	37.0	332
WFBQ	INDIANAPOLIS	IN	234	B	58.0	245
WIOG	BAY CITY	MI	273	B	86.0	244
WOMC	DETROIT	MI	282	B	190.0	110
WBCT	GRAND RAPIDS	MI	229	B	320.0	238
WVGR	GRAND RAPIDS	MI	281	B	108.0	183
WOOD-F	GRAND RAPIDS	MI	289	B	265.0	247
WBUF	BUFFALO	NY	225	B	91.0	177
WNED-F	BUFFALO	NY	233	B	105.0	216
WDCX	BUFFALO	NY	258	B	110.0	195
WTSS	BUFFALO	NY	273	B	110.0	355
WPIG	OLEAN	NY	239	B	43.0	226
WNTQ	SYRACUSE	NY	226	B	97.0	201
WVYY	SYRACUSE	NY	233	B	100.0	198
WFRG-F	UTICA	NY	282	B	100.0	151
WMJI	CLEVELAND	OH	289	B	16.0	344
WNCI	COLUMBUS	OH	250	B	175.0	171
WHKO	DAYTON	OH	256	B	50.0	325
WFGY	ALTOONA	PA	251	B	30.0	287
WKYE	JOHNSTOWN	PA	238	B	57.0	323
WLTJ	PITTSBURGH	PA	225	B	47.0	271
WWSW-F	PITTSBURGH	PA	233	B	50.0	247
WDVE	PITTSBURGH	PA	273	B	55.0	250
WKSB	WILLIAMSPORT	PA	274	B	53.0	387
WVKL	NORFOLK	VA	239	B	40.0	268
WRVQ	RICHMOND	VA	233	B	200.0	107
WTVR-F	RICHMOND	VA	251	B	50.0	256
WINC-F	WINCHESTER	VA	223	B	22.0	434
WOLX-F	BARABOO	WI	235	B	37.0	396
WJLS-F	BECKLEY	WV	258	B	34.0	320

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Appendix L Thanks!

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